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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Deok-Yong Kim

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EXAMINER

ROSARIO, DENNIS

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/749,670	Applicant(s) KIM ET AL.	
	Examiner Dennis Rosario	Art Unit 2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 March 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-27 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-27 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

1. The amendment was received on 3/24/08. Claims 1-27 are pending.

Response to Arguments

2. Applicant's arguments, see pages 7 and 8 of the remarks, filed 3/24/08, with respect to 102(e) have been fully considered and are persuasive. The rejection of the respective claims has been withdrawn.
3. Applicant's arguments filed 3/25/08 have been fully considered but they are not persuasive.

Applicants state that Tanaka does not mark a target pixel as defective if the raw datum is "within the threshold". The feature of "within the threshold" as discussed by applicants on page 9 of the remarks is not claimed.

The examiner assumes that applicant originally intended to state that Tanaka does not mark a target pixel as defective if the raw datum is within the threshold region (emphasis added).

The examiner believes that there is a distinction between "within a threshold" and "within a threshold region" since the threshold has no immediate spatial relationship and the threshold region has a spatial relationship because threshold region is understood as a region with an associated threshold.

Applicants further assume that the inside of fig. 20, num. 49 is the threshold region and compares the region to fig. 9 of the application, but the examiner has identified the threshold region to include the inside of 49, 49 itself, and the outside of 49 as the threshold region since fig. 20 shows a region defined by a vertical and horizontal axis with origin at the intersection of the axes for thresholding values.

Clearly, Tanka shows a threshold region as shown in fig. 20 including one pair of upper and lower limits as defined by the curve of 49 across the horizontal axis. Tanaka does not mark a pixel as defective if the raw datum (or difference value) is within the upper and lower limits or inside said 49, but does mark a pixel as defective if the pixel is above the upper limit or under the lower limit. Note that fig. 20, num. 40 is noise which is interpreted the same as the claimed defect and is contained within the upper and lower limits that appears to be marked as hatched lines to further distinguish the hatched lines from other noise that has been marked with dots as shown in fig. 17(a), num. 58. Thus, Tanka broadly teaches noise, which is the same as a defect, within the upper and lower limits of said 49 and defects of interest outside the upper and lower limits of said 49.

Further, Tanaka divides the threshold region of fig. 20 into multiple threshold regions corresponding to fig. 25 that shows a defect of interest 26 between threshold region LEVEL 2 and threshold region LEVEL 3 in order to automatically classify the defects in multiple categories as shown in fig. 21 where each category corresponds to said one of multiple threshold regions of fig. 25.

Further, Tanaka teaches that fig. 26 that shows marked defects in 71a-71c obtained using said fig. 25 that can further be supplemented with the method of fig. 16, the results of which is shown in fig. 21, so that the “defect state can be recognized more in detail” in col. 21, lines 44-48 to include bright defects represented as positive values in fig. 21 and dark defects represented as negative values in the plot of fig. 21.

Applicants further state that Tanaka does not teach where the threshold region does not include a zero value. The examiner respectfully disagrees since Tanaka teaches a threshold region as shown in fig. 25 as num. 26 which is a point that does not include a zero value since the point of 26 does not include zero coordinates or origin coordinates.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1,2,5-10,13-21 and 24-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuwabara (US Patent 6,980,686 B2) in view of Tanaka et al. (US Patent 7,116,816 B2).

Regarding claim 1, Kuwabara discloses a method of detecting a defect on a substrate, the method comprising:

- a) irradiating (fig. 6,num. 12) a light on a substrate (fig. 6,num. 19), wherein the substrate has a plurality of device units (fig. 2A) formed thereon with the same pattern, the plurality of device units each including a plurality of pixels (since fig. 2A is imaged);
 - b) measuring image information (as indicated in fig. 2A: "COMPARED") for the plurality of pixels by sensing the light reflected by a surface of the substrate from the irradiating light;
 - c) calculating a raw datum (fig. 11,num. 223) of a target pixel by subtracting the image information of a corresponding pixel from the image information of the target pixel (to obtain a "differential image" in col. 10, line 4), wherein the target pixel is a subject pixel for detecting a defect, and wherein the corresponding pixel is located in a first device unit that is adjacent to a second device unit (displaced in time via fig. 7,num. 206) that includes the target pixel, the corresponding pixel corresponding to the target pixel;
 - d) presetting a threshold (corresponding to fig. 11,num. 224).
- Kuwabara does not teach the remaining limitations of:
- e) a threshold region including at least one pair of upper and lower limits;
 - f) comparing the threshold region with the raw datum; and
 - g) marking the target pixel as defective if the raw datum is within the threshold region.

However, Kuwabara does teach that the threshold of fig. 11, num. 224 is "not restricted" in col. 10, line 17; thus, the threshold value can be modified.

Tanaka teaches a threshold that is used with difference images (fig. 20 which corresponds to fig. 19:DIFFERENCE IMAGE) and the remaining limitations of claim 1 of:

e) a threshold region (as shown by the space in fig. 25 between LEVEL 3 and LEVEL 4 as shown in fig. 25) including at least one pair of upper and lower limits (in fig. 25 that shows LEVEL 3 that is a minimum limit for detecting one type of defect and LEVEL 4 that is a minimum limit for detecting a second type of defect that is above LEVEL 3; thus, LEVEL 4 is an upper limit);

f) comparing (the results of which is shown in fig. 26) the threshold region (such as the region between LEVEL 2 and LEVEL 3 of fig. 25 to obtain one of the symbols shown in fig. 26, num. 71c) with the raw datum (to modify the results of fig. 26 using fig. 25 with the method of 16 as discussed in col. 21, lines 44-48 to further identify the defects as dark or bright: the combined results of which is shown in fig. 21 that shows the triangles that represents a dark defect separated from bright defects represented as diamonds and squares); and

g) marking the target pixel as defective if the raw datum is within the threshold region (as shown by the legend in fig. 21,num. 26).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Kuwabara's differential image for thresholding with Tanaka's difference images for thresholding, because Tanaka's teaching provides an "easy" in col. 20, line 11 classification of defects so that an operator can take corrective action for each type of classified defect.

Regarding claim 2, Kuwabara of the combination teaches the method of claim 1, wherein the substrate includes:

- a) a wafer (fig. 1,num. 19) for fabricating a semiconductor device, and
- b) the plurality of device units (fig. 2A) are unit cells operating as independent electronic circuits on the wafer.

Regarding claim 5, Kuwabara of the combination teaches the method of detecting a defect on a substrate of claim 1, wherein the image information includes binary digital information (fig. 7,num. 205: 2-BIT IMAGE).

Regarding claim 6, Kuwabara of the combination teaches the method of detecting a defect on a substrate of claim 5, wherein the image information represents a level on a gray scale (corresponding to fig. 7, num .201: GRAY LEVEL IMAGE DATA), wherein the gray scale is distinguishable by a relative density of black and white.

Claim 7 is rejected the same as claim 6. Thus, argument similar to that presented above for claim 6 is equally applicable to claim 7.

Regarding claim 8, Tanaka of the combination teaches the method of detecting a defect on a substrate of claim 1, further comprising:

- a) displaying the defective pixel on a monitor (fig. 1,num. 17).

Claims 9,10,13 and 14 are rejected the same as claims 1,2,7 and 8. Thus, argument similar to that presented above for claims 1,2,7 and 8 of a method is equally applicable to claims 9,10,13 and 14 of an apparatus, respectively.

Regarding claim 15, Kuwabara of the combination teaches the apparatus of claim 9, wherein the image detector includes a photo-sensor (fig. 1,num. 17).

Regarding claim 16, Kuwabara of the combination teaches the apparatus of claim 9, wherein the image detector generates the analog image information for each pixel of each device units (fig. 1).

Claim 17 is rejected the same as claim 16. Thus, argument similar to that presented above for claim 16 is equally applicable to claim 17.

Claims 18 and 21 are rejected the same as claim 1. Thus, argument similar to that presented above for claim 1 is equally applicable to claims 18 and 21.

Claim 19 is rejected the same as claim 1. Thus, argument similar to that presented above for claim 1 is equally applicable to claim 19 except for the additional limitation of presetting a threshold region (or a point corresponding to fig. 25, num. 26) including at least one pair of upper and lower limits (since said point is between limits or thresholds that a spatially arranged as the claimed upper and lower limits) not including a zero value within the region (since said point does not include origin coordinates as shown in fig. 25 as the intersection of the axes).

Claim 20 is rejected the same as claim 1. Thus, argument similar to that presented above for claim 1, last limitation is equally applicable to claim 20.

Claims 24-27 are rejected the same as claims 5,6 and 8. Thus, argument similar to that presented above for claims 5,6 and 8 is equally applicable to claims 24-27.

6. Claims 3,4,11,12,22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuwabara (US Patent 6,980,686 B2) in view of Tanaka et al. (US Patent 7,116,816) as applied to claim 1, above, further in view of Spaeth (US Patent 2,349,012).

Regarding claim 3, Kuwabara of the combination does not teach the limitations of claim 3, but teaches using a illuminating light as shown in fig. 5 which suggests to one of ordinary skill in the art of light sources a selection of light sources.

Spaeth teaches a light source and the remaining limitation of claim 3 of
a) the irradiating light includes a short-wave light ("shortwave radiant energy" page 5, right column, lines 40,41).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to use Spaeth's teaching of shortwave radiant energy with Kuwabara's teaching of the illuminating light, because Spaeth's teaching can generate an "illuminating light source of high efficiency" in page 5, right column, lines 43,44 using the shortwave radiant energy.

Claim 4 is rejected the same as claim 3. Thus, argument similar to that presented above for claim 3 is equally applicable to claim 4.

Claims 11,12,22 and 23 are rejected the same as claims 3 and 4. Thus, argument similar to that presented above for claims 3 and 4 is equally applicable to claims 11,12,22 and 23.

Conclusion

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dennis Rosario whose telephone number is (571) 272-7397. The examiner can normally be reached on 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Bella can be reached on (571) 272-7778. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Dennis Rosario/
Examiner, Art Unit 2624

/Matthew C Bella/
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